

ABSTRACT OF THE DISCLOSURE:

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This invention provides methods of treatment for work products of materials such as steel, bronze, plastic, etc. and particularly welded steel bodies by pulse impact energy, preferably ultrasonic, to relax fatigue and aging and extend expectant life. The treatment may occur (a) at original production, (b) during the active life period for maintenance or (c) after failure in a repair stage. The ultrasonic treatment improves the work product strength. In welded products residual stress patterns near the weld sites are relaxed and micro-stress defects such as voids and unusual grain boundaries are reduced. The basic method steps are non-destructive in nature, inducing interior pulse compression waves with ultrasonic transducers and accessory tools impacting an external product surface with enough impulse energy to heat and temporarily plasticize the metal interior and relax stresses. The nature of the work product interior structure being treated is determined by sensing the mechanical movement at the impact surface of the work body to produce feedback frequency and phase signals responsive to input impact signals. These signals automatically conform driving pulse energy frequency and phase to the input transducers to match the mechanical resonance frequency of the working transducers and increase efficiency of energy transfer. Such feedback signals also are available for automated procedures which can improve product quality and consistency.